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THE ASH LEAF BUG, *NEOBORUS AMOENUS* REUT. (HEM.)¹

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NEW BRUNSWICK, N. J.

This species was described by Reuter, who adopted the manuscript name of Professor Uhler. In his paper, "Bemerkungen über Nearctische Capsiden nebst Beschreibung neuer Arten," in which the description appears under the name *Tropidosteptes amoenus*, he states that the above mentioned species is usually placed in American collections under the name *Neoborus saxeus* Dist., the light varieties under the name *Neoborus amoenus* Uhl., and that it cannot possibly be identical with Distant's species. He further states that in *Neoborus saxeus* Dist. (Biol. Centr. Amer. Rhyn. Heter., I, 1884), p. 276, T. XXVI, f. 5) the first antennal joint is pointed out as being longer and dark, the ground color of the beak pitch brown, the femoral joint chestnut brown, etc., and that the North American species must therefore be known as *Neoborus amoenus* Uhl., which is very variable in color, extending from the lightest varieties through all the variations to the darkest (see Uhler, *Neoborus saxeus*, Proc. Cal. Acad. Sc. (2), IV, 1894, p. 264), also that this species is distinguished from the remaining species of the genus by the light antennæ and by the colored tips of the sides of the pronotum, otherwise it conforms with them in all generic characteristics.

In Van Duzee's check list of the Hemiptera of America, North of Mexico, it appears as *Neoborus amœnus* Reut., with *saxeus* Uhl., as a name cited in error and the following varieties, *palmeri* Reut., *plagiata* Reut., *signata* Reut., and *scutellaris* Reut.

In the same list its distribution is roughly given as Canada, Eastern states to the Mississippi Valley and eastern Canada. Smith in "Insects of New Jersey" records it from New Brunswick on ash.³ It has

¹ Identified by Mr. H. G. Barber.

² The arrangement of the authors' names is alphabetical only and indicates neither seniority nor precedence.

³ It has been found by the authors on the white ash (*Fraxinus americana*), green ash (*F. lanceolata*), red ash (*F. pennsylvanica (pubescens)*), and the English ash (*F. excelsior* var. *pendula*).

however a much wider distribution in New Jersey, having been found by the authors at Somerville, Milburn, South Orange, Kingston, Springfield, Irvington, Rutherford, Morris Plains and Elizabeth, and is undoubtedly a well-distributed species.

When present in large numbers, the foliage of ash trees is damaged considerably by the adults and nymphs feeding on the undersides of the leaves, causing numerous white spots to appear on the upper surfaces. The nymphs and adults are quite active, move about rapidly and feed singly. In severe infestations, the leaves become dry and somewhat curled. This is especially true of young tender leaves which have been additionally injured by egg deposition. In the latitude of New Brunswick, N. J., there are two generations, the first adults appearing the latter part of May or the first of June. Eggs are deposited in the midribs of the younger leaves and hatch in from ten days to two weeks. Each nymphal stage requires from four to eight days depending on the temperature, the average length of time consumed from egg to adult being about five weeks. Adults of the first brood are usually plentiful about the middle of July at New Brunswick, those of the second brood appearing the latter part of August. In the more northern parts of New Jersey they appear from one to two weeks later. On account of the somewhat extended oviposition period, it is quite possible to find later stage nymphs and adults present at the same time.

Egg.—Length 0.4 mm., width 0.14 mm. The eggs which are translucent, flask-shaped, broad and rounded at the posterior ends are deposited in the midribs on the undersides of young, tender leaves. The whitish circular rim of the egg cap projects out a slight distance, but is effectively hidden by the pubescence on the midrib. In fact, on account of its hairy condition, the eggs as a rule are somewhat difficult to find especially if they are deposited close to the leaf surface. Where many eggs are deposited in a rib, the leaf becomes somewhat curled.

First Stage Nymph.—Length 0.6 mm. Body oblong, broadening posteriorly (in newly hatched specimens, narrowing posteriorly), obtusely pointed at both ends. Head triangular, eyes lateral, prominent, granular. Thoracic segments distinct, pro- and mesothorax of equal length, metathorax shorter. Abdominal segments distinct in newly hatched specimens, later becoming indistinct. Rostrum extending posteriorly beyond thorax.

Color.—Reddish brown, lighter posteriorly, light longitudinal median line on thorax, curved transverse line on vertex of head. Legs and antennæ white and somewhat hairy, more so on distal antennal segment.

Second Stage Nymph.—Length 0.9 mm. Body ovate, head triangular, eyes prominent, lateral granular. Thoracic segments distinct, broadest posteriorly. Prothorax longest, mesothorax slightly shorter, metathorax shortest. Abdomen rounded, broadest at middle, segments somewhat indistinct.

Color.—Head and thorax dark reddish brown, light median line on thorax, curved transverse line on vertex of head. Abdomen light reddish brown. Legs and antennae yellowish white. Hairs of appendages similar to those of first nymphal stage. Ventral surface reddish brown, sides and apex of abdomen lighter. Abdominal segments distinct, margins laterally. Rostrum extending to third pair of legs with apical two thirds yellowish white.

Third Nymphal Stage.—Length 1.3 mm. Body ovate, head triangular, eyes lateral, prominent, granular. Mesothorax longest, metathorax shortest of thoracic segments. Sides of thorax rounded, broadening posteriorly. Mesothorax broadest. Abdomen rounded, broadest anteriorly, segments distinct.

Color.—Head and thorax dark brown, with median, longitudinal, light line. Curved transverse line on head. Abdomen light reddish brown, darker transverse, broken lines on several segments. Legs and antennae yellowish white, darker than in preceding stages. Ventral surface reddish brown, sides and apex of abdomen lighter. Abdomen and thorax with distinct margin. Rostrum extending to third pair of legs, apical two thirds yellowish white.

Fourth Nymphal Stage.—Length 1.6 mm. Body oval, head triangular, eyes lateral, prominent, granular. Pro- and mesothorax of equal length, metathorax half as long. Thorax broadening posteriorly, at sides meso- and metathorax extending posteriorly. Mesothorax covering metathorax forming wing pads. Abdomen broadly rounded.

Color.—Head and thorax dark brown, almost black. Light median longitudinal line on thorax meeting curved, transverse line on head, which extends to lateral margins in front of eyes. Eyes slightly lighter in color than head. Abdomen light, reddish brown, with

median, broad, transverse bands anteriorly. Legs and antennae light yellowish brown. Some nymphs of this stage have head light brown, thorax light, yellowish brown medially, dark, transverse, more or less broken bands extending across most of abdominal segments. Ventral surface yellowish brown except at margins of thorax. Rostrum extending to third pair of legs.

Fifth Nymphal Stage.—Length 2.3 mm. Body oval, narrowing anteriorly, broadest at apical third of wing pads. Head triangular, eyes lateral, granular, more pronounced than in preceding stage. Tip of each granule is black giving a mottled appearance. Prothorax broadest at posterior end, sides margined, straight. Mesothorax slightly longer than prothorax and covering metathorax save at center. Wing pads extending posteriorly half the length of the abdomen.

Color.—Head yellowish brown, with a median and lateral, longitudinal dark lines. Median line broadening transversely at base. Prothorax marked with dark bands at lateral and anterior margins and bands parallel to them. Wing pads mottled with darker markings at center and anteriorly. Abdominal segments darkened transversely. Entire dorsal surface light yellowish brown. Legs and antennae yellowish. Ventral surface yellowish white except at sides of thorax, which are reddish. Rostrum extending to between first and second pair of legs, apical two thirds whitish, tip black.

Adult.—In O. M. Reuter's paper, "Bemerkungen über Nearctische Capsiden nebst Beschreibung neuer Arten," published in Acta Societas Scientiarum Fennicae, Tom. XXXVI, No. 2, p. 48, there appears the following description of *Tropidosteptes amoenus* Reut.: "Oblongo-ovalis, colore variabilis, glaber, sat nitidus, superne, capite excepto, sat crebre et sat fortiter punctatus; rostro pedibusque lividis, extremo apice rostri articuliue tertii tarsorum nigro, capite basi pro-noti $\frac{3}{7}$ angustiore, ab antico viso distincte transverso (σ) vel latitudine postica parum vel paullulum brevior, genis oculo paullo magis quam dimidio (σ) vel paullo (φ) humilioribus, vertice postice tenuissime (σ) vel tenuiter (φ) marginato, oculo æque lato (σ) vel hoc circiter $\frac{2}{3}$ duplo latiore (φ), medio plerumque impressione longitudinali instructo; rostro medium vel fere apicem coxarum inter-mediarum attingente; antennis gracilibus, articulo primo capite ab antico viso paullo minus quam $\frac{1}{3}$ brevior, secundo primo magis

quam duplo et dimidio (σ) vel solum circiter duplo (ρ) longiore et margini basali pronoti æquelongo (σ) vel hoc saltem $1/4-1/3$ brevior (ρ); pronoti latitudine basali circiter $1/3-2/5$ brevior, sat crebre, fortiter punctato, strictura apicali versus latera gracilescente callis tertiam apicalem partem haud superantibus, lateribus apicem versus distincte calloso-marginatis, intra marginem longitudinaliter impressis; scutello paullo subtilius punctato; hemielytris abdomen longe superantibus, marginale costali modice rotundatis, crebre punctatis. Long. 5, lat. $2\frac{1}{10}$ (σ)- $2\frac{1}{2}$ (ρ) mm."

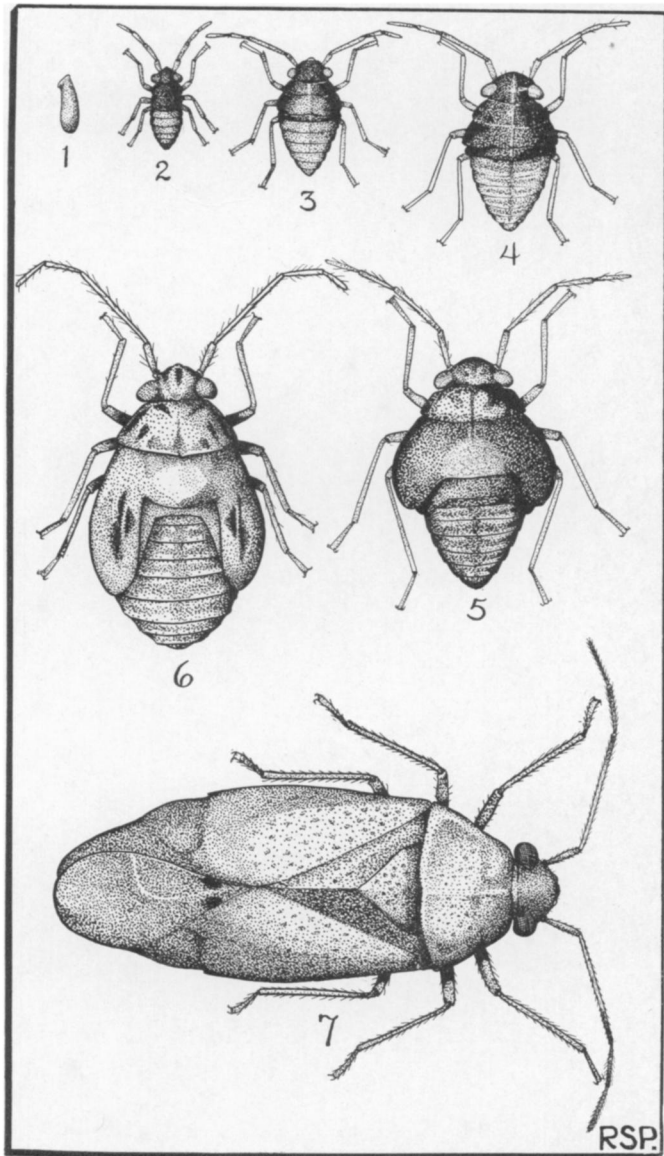
In the same article, there also appears brief descriptions of the varieties *palmeri*, *plagiata*, *signata*, *scutellaris*.

EXPLANATION OF PLATE 16.

- Fig. 1. Egg.
- Fig. 2. First stage nymph.
- Fig. 3. Second stage nymph.
- Fig. 4. Third stage nymph.
- Fig. 5. Fourth stage nymph.
- Fig. 6. Fifth stage nymph.
- Fig. 7. Adult (female).

MISCELLANEOUS NOTES.

Some Respiratory Structures of Dragonfly Larvæ.—In the little Zygoptera or damsel flies, the respiratory arrangement is vastly different from that of other dragonflies. These nymphs all have three big flat external gills, forming a sort of triple tail at the end of the abdomen. But what is most strange is that these nymphs will live if the external gills are all broken off. I could find nothing in the way of discovered fact about these insects except the old statement that the blackwing, *Calopteryx*, had as a nymph three gills in his rectum. I dissected four of the common small Agrionidæ, including the common brown Lestes, blue Enallagma and others. Their rectum was the same as that of any insect, with just three glands in it; but in *Argia putrida*, I happened to work further forward, and in this creature I found that the intestine, just caudad of the Malpighian tubules, is expanded into a globular ampulla. On the surface of this ampulla are three fatty bags, well tracheated, one of



Neoborus amoenus Reut.